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VISG CO-ORDINATOR'S NOTE

by Natalia Deligne

It's been a busy quarter, starting with the Cities on Volcanoes 10 conference in Naples, Italy, attended by an impressive kiwi crowd. **Angela Doherty** (Auckland Emergency Management) and **Matthew Harrex** (Emergency Management Bay of Plenty) report back on their experiences in **Conference Reports**. The conference provided for fruitful discussions and exchange of ideas, strategies, and findings for how we can co-exist with volcanoes.

There continues to be a lot of work on the Auckland Volcanic Field. This quarter's **Research Spotlight** by **Josh Hayes** and others presents the newly published DEVORA scenarios – a suite of 8 scenarios based

on the latest research here and around the world, describing what an Auckland eruption could entail in terms of hazard sequence, footprint, and intensity. Research is already underway using these scenarios to explore ramifications for society across Auckland.

Finally, see **Upcoming Events** for information on the annual Volcano Short Course for emergency managers, lifelines, and anyone else who may have to deal with volcanoes 'on their watch' (or who is interested in learning more).

NEWS

Over 30 New Zealand scientists, students, emergency managers, and iwi attended the **Cities on Volcanoes 10 conference** in Naples, Italy in September. The conference provided a great opportunity to exchange ideas with our global community on how to live with volcanoes – see the conference reports in this newsletter.



Kiwis at the Cities on Volcanoes 10 conference in Naples, Italy, including some based overseas and a few former students.

The **2019 DEVORA Forum** on 25-26 October was a great success, with over 60 people attending, including international colleagues from the UK and Singapore. The first day focused on the latest research concerning the how and what of the Auckland volcanic field (AVF), while the second day focused on advances in understanding the consequences of an AVF eruption and planning and response initiatives.

One further **VISG poster** has been updated: Advice for **Urban Clean-up**. To date, five posters have been updated. The remaining posters in the poster series are currently being updated.

The Determining Volcanic Risk in Auckland (**DEVORA**) project, has a new product: **fact sheets** on various aspects of the Auckland Volcanic Field. The first one, City of Volcanoes: The Auckland Volcanic Field, Ngā Tapuwai Ō Mataaaho, was published last year. The second one, Hidden Eruptions: The Search for Auckland's Volcanic Past, is in final stages of approval. It covers how volcanic ash, from Auckland and other New Zealand volcanoes, preserved in lake beds, can be used to determine how often Auckland is affected by volcanic eruptions. DEVORA fact sheets are available at <http://www.devora.org.nz/our-research-explained/>.

RESEARCH SPOTLIGHT

Introducing the DEVORA Scenarios

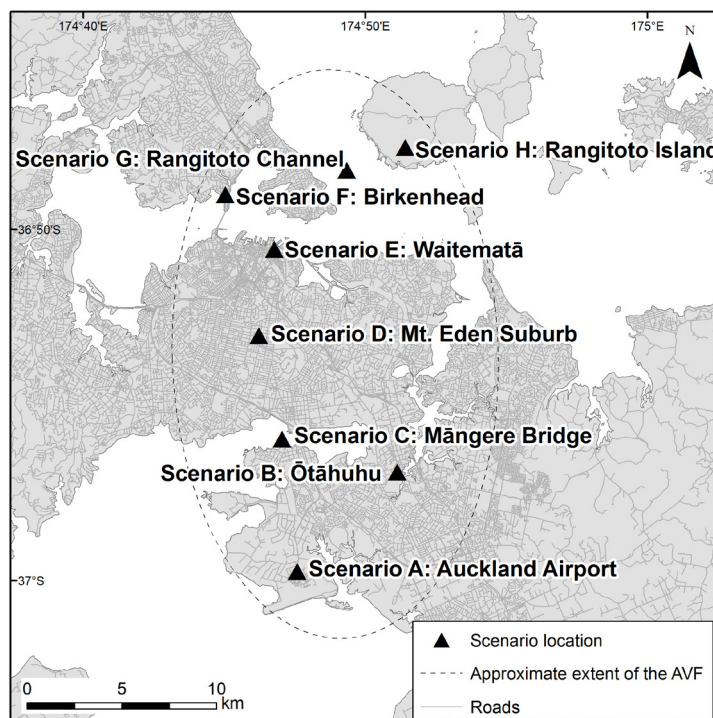
By Josh Hayes (University of Canterbury), Natalia Deligne (GNS Science), and Tom Wilson (University of Canterbury)

Auckland, our largest city, is exposed to several natural hazards, including flooding, extreme weather, tsunami, earthquakes, and local and regional volcanism. The Auckland metropolitan area is built on the Auckland Volcanic Field (AVF), a field which has produced at least 53 eruptions in the last 190 thousand years, each eruption in a new location producing a brand-new edifice – a cone, tuff ring, and/or big hole in the ground (a ‘maar’). The eruptions have produced pyroclastic surges, lava flows, ash fall deposits, along with other hazards which are rarely preserved as geological features, such as ballistics projectiles (bits of rock exploded during the eruption) and volcanic gas. Since 2008, the Determining Volcanic Risk in Auckland (DEVORA) research programme has funded and facilitated a much-improved assessment of volcanic hazard and risk in the Auckland metropolitan area, with an aim to provide a strategy and rationale for appropriate risk mitigation.

We don’t know where or when the next eruption of the AVF will be. We also don’t know whether it will be a small, average, or large AVF eruption. This uncertainty is challenging for planning purposes. To explore what might happen, we have developed the ‘DEVORA scenarios’ (see map): a suite of 8 hypothetical eruption scenarios spread across the AVF that describe credible eruption sequences that go from volcanic unrest through to an eruption. One scenario – Mangere Bridge – was published last year, but the remaining 7 are brand new.

Development of the scenarios was strongly driven by a desire from various stakeholders for a diverse set of volcanic scenarios that would be useful for a variety of disaster risk reduction purposes, including evacuation, welfare and infrastructure disruption planning. Practitioners and policy experts from Auckland Emergency Management and Auckland Lifelines Group in particular played a crucial role in ensuring the scenario will be useful, useable and used.

The scenarios were developed by a small core team, led by Josh Hayes, who designed the scenarios using the latest scientific research. The next step was to open up the process to critical peer review to ensure credibility and to (hopefully) create a collective sense of ownership. Everyone on the DEVORA listserv, practitioners and scientists alike, was invited to be a reviewer. To ensure that the main disciplines were covered, a personal invitation was extended to a subset of experts. In the end, 14 people provided very detailed reviews of the scenarios resulting in considerable improvements to the scenarios. All reviewers had the opportunity to provide a second review after the revision. Reviewers came from Auckland Council, GNS Science, Massey University, University of Auckland, University of Canterbury, University of Otago, and Université Clermont Auvergne (France).



Map showing the vent areas of the DEVORA scenarios. The approximate extent of the Auckland volcanic field is indicated with a dashed line.

The DEVORA scenarios are based on research on AVF volcanic hazards and analogous eruptions from around the world, and cover a credible range of eruption sizes, eruption durations, and eruption sequences. The extent of various volcanic hazards were produced using physical models. The scenarios are all within the Auckland Volcanic Field. The locations have been selected to cover a range of site types, from an eruption in the middle of a residential area to one under an infrastructure hotspot to one the North shore. We have also ensured that our suite will cover a wide range of expected eruption types based on the local environmental conditions, including eruptions in relatively deep water to high ground.

The scenarios currently only describe the eruption narrative and the footprint and intensity of the suite of volcanic hazards in space and time. The scenarios will serve as a foundation for exploring the societal ramifications of an Auckland eruption in future studies. Our expectation is for the scenarios to be used within AVF volcanic impact and risk studies and to support volcanic risk mitigation and asset management practices. The scenarios are published in GNS Science Report 2018/29, available at <http://shop.gns.cri.nz/publications/science-reports/2016-to-current/2018/>.

CONFERENCE REPORT: CITIES ON VOLCANOES 10

Over 800 scientists, emergency responders, educators, artists, community members, and others attended the Cities on Volcanoes 10 conference in Naples, Italy, the first week of September 2018. The strong kiwi contingency included Angela Doherty and Matthew Harrex, who here report back on their experiences.

Report from Angela Doherty, Auckland Emergency Management

“Vedi Napoli e poi muori!” (see Naples then die), is a famous phrase used by travellers on their “Grand Tour” of 17th century cultural Europe to describe the beauty of this coastal Italian city. Perched precariously on the Mediterranean between the towering volcanic cone of Mt Vesuvius and an active volcanic field known as Campi Flegrei (Burning Fields), Naples seems like an odd place to build a city. Some of the most famous eruptions in history have taken place on its doorstep, including the cataclysmic AD 79 eruption of Vesuvius that famously buried the towns of Pompeii and Herculaneum, and the eruption of Campi Flegrei that some scholars believe led to the extinction of the Neanderthals in southern Europe. Despite this, people have lived here for many thousands of years.

Like the Neapolitans, communities around the world are drawn to volcanic areas by their rich soils, beautiful vistas, and access to building materials. But living with volcanoes means living with danger. This is the basis of the biennial Cities on Volcanoes Conference, which brings together scientists, civil protection, local government and stakeholder representatives from around the world. They meet to present the latest breakthroughs in volcano-science and share their experiences and challenges in monitoring, planning for and living in the shadow of these geological timebombs.

This year, Cities on Volcanoes was held in Naples, which happens to be the city I was based in for most of my PhD and post-doctoral research. So, it felt like a bit of a homecoming when I was supported by DEVORA to join a large New Zealand contingent attending the conference. The theme was “Millennia of Stratification between Human Life and Volcanoes: strategies for coexistence” with a strong focus on civil protection, communication and public education strategies.

This year was the largest so far, with around 800 attendees from more than 50 countries. It consisted of 6 concurrent sessions with speakers discussing everything from diffusion rates of elements in minerals, to the use of drones and satellites in volcano monitoring, to the growing implications for the insurance industry. There were numerous workshops on a range of topics both before and after the conference. And in addition to my conference presentation on how the Auckland Council deals with life in a volcanic field, I was asked to be a voice of decision-makers in a science communication workshop with VISG’s Dr Natalia Deligne and other representative from volcano observatories, civil protection institutes and science communication professionals from around the world (see photo). There was also a parallel conference programme featuring seminars on volcano-themed topics and screenings of famous volcano films, and field trips to volcano “hotspots” around the region and in the bay, all underpinned by the famous Italian cuisine and hospitality.



Stan (CDEM mascot) addresses participants of the Communicating Volcanic Hazards workshop associated with COV10. Photo credit: Angela Doherty

This trip also gave us the opportunity to meet our Italian counterparts and visit a number of INGV (Italian Institute of Geology and Volcanology) and Italian Civil Protection institutes in Naples, Sicily, and the Aeolian Islands, seeing first-hand how our Mediterranean colleagues actively monitor a country even more geologically active than our own. The strong connections between these two groups echo the relationships we have in New Zealand between scientist and stakeholders, and we made a number of connections we hope to build into valuable partnerships in the future.

It was two weeks of great conversations, great food, and great people from all areas of volcano-science, all working together to share strategies on how we can learn more, and not just live, but prosper in such close vicinity to volcanoes. A repeated message throughout the event was the need for greater engagement of the science community with stakeholders and decision-makers, and this was reflected in the growing number of presentations from civil protection, response agencies and the lifelines industry. While many are put-off attending conferences because of their perceived hard-science focus, Cities on Volcanoes is truly a multi-disciplinary event and we hope to see even more stakeholder and decision-maker involvement in the 2020 conference in Heraklion, Greece.

Report from Matthew Harrex, Emergency Management Bay of Plenty

As Chair of the Bay of Plenty Waikato Caldera Advisory Group (CAG), I was privileged to have the opportunity to attend the Cities on Volcanoes Conference 10 in Naples, Italy. This was thanks to the ECLIPSE Research Programme, a unique collaborative research project that brings together the scientific and emergency management communities alongside local iwi to better understand and manage the risk of living on the most active supervolcano system on earth – the Taupō volcanic zone. Initially I was a little sceptical of attending the conference, however a couple of conversations with people who have attended in the past convinced me to go and check it out.

The COV10 conference is unlike anything I have attended before:

- It is big - over 800 participants from across the globe;
- There is a lot of information – 4 days of talks across a number of themes, countless posters, with a field trip in the middle to break it up;
- It is diverse – as well as scientists, attendees included emergency managers, educators, community representatives and volunteer organisations.

In the opening address a challenge was laid down to the scientific community to broaden their views and be prepared to listen to the ideas of the non-scientific community. This was going to be an interesting week I thought, and I wasn't disappointed.

There are three general things that made the conference great for me.

1. The opportunity to learn from others

This is a given when it comes to conferences, but the breadth and diversity of talks and presentations at COV10 guarantees opportunities in most sessions to hear of a new or unique way to look at the volcano problem.



Matthew Harrex (third from left) with Italian Emergency Management counterparts at COV10.

The field trip around the Campi Flegrei caldera gave us an opportunity get a first-hand experience on managing a city living on a caldera in unrest. Caldera unrest is the focus of the Bay of Plenty Waikato Caldera Advisory Group. We could see the effects of caldera unrest in action and heard the challenges scientists and emergency managers face managing it. Planning to evacuate 600,000 people from Campi Flegrei in 72 hours is one challenge I am glad we do not have to face.

2. Establishing and building relationships

Throughout the week I was fortunate to meet a huge number of talented and experienced individuals. I was able to meet and share ideas with my Italian Emergency Management counterparts (see photo). We made a strong connection with the scientists, emergency managers and local government officials working in Campi Flegrei. This has the potential to be the beginning of a long-standing relationship where we can learn from each other to better manage the common risks we face. Equally as important, I had the opportunity to build stronger relationships and understanding with many of the fellow kiwis at the conference.

3. Understanding where we fit in the world of volcanoes

As kiwis we pride ourselves in our ability to punch above our weight. It seems that the world of volcanoes it is no exception. I was proud to hear the kiwi contingent speak and witness the respect and standing they hold in the international scientific community.

From what I saw we are up there with the best when it comes to:

- Undertaking research that is meaningful and meets the needs of the end user;
- Collaborative working between scientists and emergency managers;
- Co-creating research with all of our stakeholders.

Better collaboration between scientists and emergency managers was a common theme throughout the week. Somewhat fittingly I would like to thank the ECLIPSE Programme for supporting my attendance at COV10 and in particular the scientists that encouraged this emergency manager give it a go.

GLOBAL ERUPTION ROUNDUP

by Sophia Tsang (University of Auckland)

Fortunately, most of the volcanic eruptions in the past two months have been relatively small and have had minor impacts to society. Thus, I will briefly summarise the end of the eruption in Hawaii and ongoing eruption at Krakatau, Indonesia before another eruption.

Kīlauea, Hawaii, USA

Since the last Eruption Roundup, the eruption in Hawai'i has ended, and local utilities have reconnected all homes to which residents have returned. Public works, such as roads, are still being built as I write. So far, all of the roads built have been gravel roads using the erupted material.



A new road built on top of a lava flow erupted from Kīlauea volcano earlier this year.
Photo credit: Sophia Tsang.

Krakatau, Indonesia

In the intervening months since I last featured the Anak Krakatau eruption, the lava flows on the side of the cone have stopped advancing. Anak Krakatau continues to release small ash plumes up to 2.4 km high. Therefore, residents and visitors must still remain outside of a 2 km exclusion zone.

Merapi, Indonesia

Merapi Volcano in Indonesia has been in a state of discontinuous eruption for years, so the area has been frequently evacuated in recent history. At the end of October, a lava dome at the top of Merapi had grown to approximately 219,000 m³, increasing the potential for a pyroclastic density current. A 3 km exclusion zone has been implemented for life safety reasons.

UPCOMING EVENTS

The **2019 Volcano Short Course** will be in **Rotorua on 4-5 December**, with one day 'in the classroom' followed by one day in the field. Please contact Brad Scott (b.scott@gns.cri.nz) for registration information.

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